Państwo i Społeczeństwo

2019 (XIX) nr 1

e-ISSN 2451-0858
ISSN 1643-8299

DOI: 10.34697/2451-0858-pis-2019-1-005

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SCREENING OF THE PELVIC FLOOR MUSCLE STRENGHT OF FEMALE PHYSIOTHERAPISTS

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Abstract

Introduction: The study compares contractions of pelvic floor muscles of female physiotherapists examined per vaginam with the results of the tests presented using Peritone device.

Materials and methods: 23 female respondents were tested and evaluated as a correlation between the muscle strength P within the PERFECT scale and the measurements of maximum voluntary contraction using Peritone device performed by two examinators.

Results: The differences in the results of the study using two methods were not statistically significant. There was also no significant difference in two independent examinations of the pelvic floor muscle strength performed by two physiotherapists.

Conclusion: Based on the results of our study we can state that female respondents of our study were assessed from the viewpoint of pelvic floor muscle strength expressed by the means of the PERFECT scale referring to good results.

Key words: Pelvic floor muscles, PERFECT scale, incontinence, physiotherapists

Introduction

Several medical specialties deal with the issue of pelvic floor. Uro-gynecology addresses the impact of single structures of the pelvic floor on the emergence of incontinence and functional sterility. The dysfunction of pelvic floor muscles is often associated with headache, pain in the area of the cervical and lumbar spine and with chronic pelvis pain. In physiotherapy increased attention is paid to these muscles considering their participation in breathing stereotype and abdominal muscles activity as a part of the activity of deep stabilizing system. These muscles play another significant role in the process of catenation of functional disorders as pelvic area is a "crossroad" of muscle chains. The cause of emergence of these disorders is associated with certain dysfunction of pelvic floor muscles whether it refers to an inborn or an acquired defect.

The number of problems connected with pelvic floor muscles dysfunction is increasing. Current knowledge on prevalence of female urinal incontinence confirms its occurrence ranging from 10 to 38%. Deviations from average prevalence occurred because data referring to some age groups only were used in the framework of surveys. Thus, nowadays pursuant to the international consensus the average prevalence occurs in the range of 20–30%. In Slovakia it was 25% referring to the estimated amount of 530,000 women. Another figure confirming the necessity to address the dysfunctions of pelvic floor muscles refers to the incidence of urinal incontinence. The annual incidence of female urinal incontinence ranges from 3 to 11% and is growing with increasing age of monitored women [7]. Based on the data mentioned above in connection with pelvic floor muscles dysfunctions it is necessary to present the possibilities offered by current physiotherapy like the methods of evaluation and therapy used when these dysfunctions occur.

Literature [4,3] offers articles on possible uses of PERFECT scale in the process of evaluation of pelvic floor muscles function; however, there are no technical articles and studies dealing with the comparison of muscle strength evaluation objectified by device measurement and per vaginam examination. The aim of the study was to compare the maximum voluntary contraction of pelvic floor muscles of female physiotherapists examined per vaginam by the means of Peritone device.

Materials and methods

The tested group consisted of 23 female physiotherapists participating in the certified course "The physiotherapy of pelvic floor muscles" implemented by REHASPRING centre (Čelákovice, Czech Republic). The average age of the respondents' group was 35,48 (SD=8,83), average weight was 60,91 kg (SD=8,93)

and average height of the tested group was 166,13 cm (SD=5,92). Out of the total amount of 23 female physiotherapists there were 8 nulliparous, 6 respondents had an abortion, 20 physiotherapists stated to have used some form of contraceptives (tablets, patch, intrauterine devices) and 6 out of the total number of female physiotherapists stated to have been incontinent (level 1). All female respondents and patients signed informed consent before initiating of research.

For the purposes of the study we used the input and output values measured with Peritone device and final measurement values expressed by the means of PERFECT scale and additional values acquired by filling in the anamnesis questionnaire. Given the goals of the study and examination of maximal voluntary contraction by the Periton device we use only the first part of PERFECT scale, P=power. Admission examination was made on the second day of the course and control examinations were made on fourth day of the course. The measured data were tested by the means of the statistical methods (Shapiro-Wilk test, Mann-Whitney test, Student's test, F-test).

Results

The average values expressed by the means of Peritone device are stated in μV unit (microvolt) as well as values calculated pursuant to the PERFECT scale when compared with average values of Peritone device. The first hypothesis assumed no difference between the values resulting from per vaginam examination of pelvic floor muscle strength (P) pursuant to the PERFECT scale and the values resulting from the examination of pelvic floor muscle strength by the means of Peritone device. For testing of the first hypothesis during admission examination we used average examination values measured by the means of Peritone device and the values of admission examinations expressed by the means of PERFECT scale or P value measured in all three postural positions – lying position, sitting position and stand implemented by two independent female physiotherapists (Table 1). For making a better practical comparison and picture we put the recalculated average values into Table 2 and compared the average value of female physiotherapist 1 and 2 (F1, F2) with the average value of Peritone device in all three positions.

The second hypothesis assumed no difference between the examination values of pelvic floor muscle strength (P) examined per vaginam pursuant to the PERFECT scale in parous and nulliparous at the admission examination in all postural positions. When testing second hypothesis the average input values of measured examinations expressed by the means of PERFECT scale or its P part were evaluated and the female respondents were divided according to the parous – nulliparous criterion. The examination values acquired from both physiotherapists in all positions – lying, sitting and stand were assessed (Table 3).

Table 1. The overview of examination values acquired from Peritone device and PERFECT scale (P).

position/ examination	Peritone (μV)	physioterapist 1	physioterapist 2	significance
Lying / input	72,8261	72,8259	73,2589	p>0,05
Sitting / input	57,0435	57,0433	57,0436	p>0,05
Stand / input	48,2609	48,2608	48,2610	p>0,05

Table 2. The table of recalculated values of PEFECT scale and Peritone device

F1, F2	Peritone
0	0 – 5,277
1	5,278 – 22,865
2	22,866 – 40,454
3	40,455 – 58,043
4	58,044 – 75,632
5	75,633 – 87,944

Table 3. The overview of admission examinations by the means of PERFECT scale

Position/ examination	Physiotherapist 1		Physiotherapist 2	
	parous	nulliparous	parous	nulliparous
Lying / input	4,3067	4,2500	4,2071	3,9875
Sitting / input	3,86	3,3625	3,68	3,6250
Stand / input	3,9933	3,7000	3,9200	3,9125

The third hypothesis assumed no difference in admission and output examinations of pelvic floor muscle strength (P) examined per vagina pursuant to PEFECT scale in parous and nulliparous in all postural positions. When testing the third hypothesis the average input and output values of measured examinations expressed by the means of PERFECT scale or its P part were used and the respondents were divided according to the parous – nulliparous criterion. The values acquired from both examinators in all three positions (Table 4).

The fourth hypothesis assumed no difference in admission and output examination of pelvic floor muscle strength of parous and nulliparous examined by the means of Peritone device in all postural positions. When testing the fourth hypothesis the average values of admission and output examinations measured by the means of Peritone device were used and the female respondents were di-

vidked according to the parous – nulliparous criterion. The examination values acquired from Peritone device in all three postural positions (Table 5).

The fifth hypothesis assumed no difference between the values of per vaginam examination of pelvic floor muscle strength (P) pursuant to PERFECT scale implemented independently by two physiotherapists in an examined female physioterapists in all postural positions. When testing the last fifth hypothesis the average values of admission and output examination implemented by physiotherapist 1 and 2 expressed by the means of PERFECT scale, part P were used (Table 6).

Table 4. The overview of examinations by the means of PERFECT scale

1,5	Physiotherapist 1		Physiotherapist 2	
	parous	nulliparous	parous	nulliparous
Lying / input	4,3067	4,2500	4,2071	3,9875
Lying / output	4,4533	4,2000	4,3933	3,9625
Sitting / input	3,86	3,3625	3,68	3,6250
Sitting / output	3,7533	3,4250	3,8000	3,7000
Stand / input	3,9933	3,7000	3,9200	3,9125
Stand / output	4,0000	3,9875	3,7267	4,2000

Table 5. The overview of examination values acquired from Peritone device

POSITION	Lying on the back		Sitting		Stand	
EXAMINATION	input	output	input	output	input	output
Parous	82,0667	85,2000	62,0000	66,3333	51,8000	59,8667
Nulliparous	55,5000	50,8750	47,7500	47,2500	47,3750	44,5000

Table 6. The overview of average input and output values pursuant to the PERFECT scale

Position/ examination	Physiotherapist 1	Physiotherapist 2
Lying / input	4,287	4,365
Lying / output	4,165	4,243
Sitting / input	3,687	3,661
Sitting / output	3,639	3,765
Stand / input	3,891	3,917
Stand / output	3,996	3,891

Discussion

The principal part of our study referred to the measurements acquired from Peritone device providing us with the most effective and objective information on pelvic floor muscle strength of the female physiotherapists examined. Its measurement error refers to +/- 0,3 microvolt. On the other hand, the values were expressed by the means of PERFECT scale, P part. They referred to the results of per vaginam examinations implemented by two independent examinators. The results showed Periton device more precise. It is important to perform the measurement several times. In practice we recommend to execute the measurement of maximum voluntary contraction of pelvic floor muscles 2–3 times in the framework of muscle strength evaluation. We recommend selecting the maximum value out of implemented measurements to be the determinative value. As for per vaginam examination and its expression by the means of PERFECT scale, manual skills and diagnostic experience of the examining physiotherapist play a significant role when assessing the pelvic floor muscle strength. As PERFECT scale provides the range for assessing the muscle strength in the amount of 0–5, there is more space for assessment. Therefore, in practice we recommend using, for example, plus and minus signs in order to specify single levels or decimal expression. It must be also noted that generally, bigger sample of female physiotherapists leads to much smaller standard errors caused by the differences in averages and statistical data strength increases adequately. In such cases it is easier to prove statistical significance.

H1: The hypothesis was made on the basis of reliability of the PERFECT scale described by the authors Laycock and Jerwood in 2001. In their study the authors compared the pelvic floor muscle strength together with perineal pressure during maximum voluntary contraction (MVC); however, respective phenomenon was studied in lying on the back position only [4]. In our study the values acquired from the PERFECT scale and Peritone device were used. When processing the results we used the mean values acquired from three measurements made on Peritone device and mean values from admission examinations pursuant to PERFECT scale. When measuring the value of pelvic floor muscle strength in all three positions we found out that there is no statistically significant difference in the values measured. Thus, we can state that per vaginam examination by using PERFECT scale made by a physioterapists is almost identical with more objective method evaluating the pelvic floor strength by the means of Peritone device. Further, when processing the results stated above we found out that examined female physiotherapists achieved the highest MVC of pelvic floor muscles in lying on the back position and the lowest in standing position. Based on these results it can be stated that female physiotherapists can exert the biggest muscle strength in posturally easiest position and this is not very suitable for us as higher postural positions (sitting, stand and walking) are used more frequently during the day.

On the basis of these results it was stated that this hypothesis can be accepted as final difference was not statistically significant (p>0,05). In this point, namely in lying on the back position we correspond with the authors above. Our study also confirmed the reliability of both approaches in other postural positions.

H2: This hypothesis was made on the basis of Laycock and Jerwood who studied the pelvick floor strength of parous and nulliparous and found out a relation between the muscle strength and probe lift [4]. In our study four female physiotherapists had no lift, out of them 2 parous and 2 nulliparous. The values of pelvic floor strength pursuant to the PERFECT scale ranged from 1 to 2+. The lift is possible at the value of 3 and more only and as the mean value of maximum voluntary contraction of examined female physiotherapists referred to 3–4, we assumed no difference between parous and nulliparous. The mean values of pelvic floor muscle strength examined pursuant to PERFECT scale were slightly higher at parous compared to nulliparous. For the purpose of this comparison we used the mean values acquired from per vaginam admission examination pursuant to the PERFECT scale made by two independent examinators. When measuring the values of pelvic floor strength in all three positions it was found out that there is no statistically significant difference in the values of per vaginam examinations of parous and nulliparous pursuant to the PERFECT scale evaluated by both examinators. Based on the examinations made by the physiotherapists both parous and nulliparous participants achieved the highest value of pelvic floor muscle strength pursuant to the PERFECT scale in lying on the back position and the lowest value in sitting position. On the basis of stated findings it can be assumed that pelvic floor muscle strength of parous and nulliparous is almost identical and based on that parturition does not affect the pelvic floor muscle strength in terms of impairment as assumed by several authors. Of course, there are many factors affecting this statement like number of parturitions, their course, time period – interval between parturition and measurement, lifestyle, etc. Based on the results above we state that we accept hypothesis 2 as there was no statistically significant difference (p>0,05) in mean values of input measurements pursuant to the PERFECT scale as for parous and nulliparous. We agree with the authors stated above that pelvic floor strength has a relation to probe lift.

H3: This hypothesis was made on the basis of the fact that pelvic floor muscles refer to a flat muscle having a small area in cross-section and that this muscle is easily fatigable. Therefore, uniform and standardized daily regime is not suitable. Long and short contractions should be examined leading to elaboration of an individual pelvic floor muscle exercise plan. The number and type of daily repetitions shall depend on the admission examination. Reilly recommends even several sessions per day. Physical fitness is related to the amount of work that the muscle is able to perform and the time necessary for recovery [6].

When processing the results we used mean values of admission and output examinations of both parous and nulliparous made by both independent physi-

otherapists. The differences between these examinations were minimal; in parous there was a bigger difference between input and output in lying on the back position. There was a situation identical with the previous one in the sitting position, only in standing position of nulliparous we found out bigger difference between admission and output examination pursuant to the PERFECT scale. The differences that were compared in parous and nulliparous at input and output assessment were in terms of both increasing and decreasing of muscle strength. In our opinion, the reason why given situation occurred was that during the course female participants performed pelvic floor muscle training intensively and this fact was manifested either by muscle fatigue or by increased pelvic floor muscle strength. This fact may also be assigned to diagnostic inexperience of the examinators who implemented input and output assessments. When making input assessments they had mostly no previous experience with per vaginam examinations but they when making output assessments, they made 15 per vaginam examinations on average in the framework of the course they participated in. This fact also could affect the results of these assessments to some degree. The mean values of admission and output examinations were tested and following applied in all positions. When measuring the values of pelvic floor strength in all three positions in both input and output it was found out that there is no statistically significant difference in the values of per vaginam examinations of parous and nulliparous pursuant to the PERFECT scale evaluated by both examinators. Based on the results above we can state that we accept the hypothesis ($p>0,05$). We might consider that one day of training of long and short contractions of pelvic floor muscles is not enough to change the muscle strength. Pelvic floor muscles consist of approximately 70% of red muscle fibres and 30 % of white muscle fibres. Therefore, we think that during routine daily activities the pelvic floor muscles work in tonical and reflex way and voluntary contractions are supposed to be trained [2]. Based on the results we assume that longer period of time is necessary for changing the muscle strength that can be identified by physiotherapist.

H4: Laycock describes optimal recommendation of pelvic floor muscle training: once a week during the time period of four weeks and then once a month during the time period of three months. The recommended examination of feedback exercises with patients shall be six months [3].

We used the mean values of admission and output examinations of pelvic floor muscle strength of parous and nulliparous by the means of Peritone device in order to evaluate the hypothesis above. The highest mean values of pelvic floor muscle strength measured by the means of Peritone device were achieved in parous and nulliparous in lying on the back position and the lowest values in parous in standing position and it was not so unambiguous in nulliparous as the values were approximately identical in both positions (sitting and stand). As for the differences of mean values of admission and output examinations in parous,

the highest value was recorded in standing position and as for nulliparous, the highest difference was recorded in lying on the back position. On the contrary, the lowest difference of mean values of input and output measurements by the means of Peritone device were recorded in lying on the back position as for parous and in the sitting position as for nulliparous. In all three postural positions the mean values of muscle strength measured by the means of Peritone device were higher in parous compared to nulliparous. As for the mean values of admission and output examinations by the means of Peritone device, following applied for all positions there was no statistically significant difference ($p>0,05$) between the files. Based on the results above this hypothesis was accepted, too. On the basis of the result of this hypothesis we can also agree with the statement made by the author above stating that pelvic floor muscles training in terms of increasing the muscle strength is a matter of a long-term and systematic training.

H5: This hypothesis was made on the basis of Laycock and Jerwood who assessed the pelvic floor muscle strength in ten female patients performed by two evaluators [4]. When assessing the difference of values in per vaginam examinations of pelvic floor muscle strength by two physiotherapists, in all three positions we used the mean values of admission and output examinations by the means of the PERFECT scale, P part. The differences in final values of single examinations were minimal. We assume it was caused by the fact that only five female participants out of the total amount of 23 had experience with per vaginam or per rectum examination during their physiotherapeutic practice. According to both independent per vaginam examinations of pelvic floor strength the highest mean values were recorded in lying on the back position and on the contrary, the lowest ones in sitting position. The difference of muscle strength mean values in admission and output examination was recorded in lying on the back position and the output pelvic floor muscle strength was lower in both examkinations. This might have been caused by the fact that examined female physiotherapists made intensive pelvic floor muscle training between the input and output assessment and we can assume that based on that it might have referred to pelvic floor muscle fatigue. On the contrary, when assessing the pelvic floor muscle strength in two remaining positions – sitting and stand the mean values measured between the input and output measurements were increased in one examining female physiotherapist and on the other hand decreased in the second one. This fact may be also assigned to potential muscle fatigue of these muscles as a consequence of intensive training of pelvic floor muscles. These findings confirm that pelvic floor muscles can be trained like any other striated muscles in our body with positive effect in terms of increasing the muscle strength.

There is no statistically significant difference ($p>0,05$) between measured input and output values in examined female physiotherapists. The last hypothesis was accepted, too. Our study corresponds with the results of Laycock and

Jerwood study and confirms evaluator's cross reliability (inter-examiner-reliability). The analysis showed highly significantly positive correlation coefficients between two evaluators who made a complete PERFECT examination in ten female patients [4].

Dumoulin, Hay-Smith made a systematic overview of the impact of pelvic floor muscle training in women suffering from urinal incontinence compared to no treatment, placebo or pretended treatment or other inadequate control treatments. This overview established a proof of widespread recommendations stating that pelvic floor muscle training should be included in first lines of the programs of conservative solution in women with stress, urgent or mixed urinal incontinence [1].

Conclusion

Based on the results we can state that female respondents of our study were assessed from the viewpoint of pelvic floor muscle strength expressed by the means of the PERFECT scale referring to good results. Another fact is the validity of per vaginam examination of pelvic floor muscle strength pursuant to the PERFECT scale for the physiotherapists "beginners" as for this technical performance. There is an unlimited amount of viewpoints that would be suitable for studies to come related to pelvic floor function (other professions, sport activity); however, another significant criterion refers to potential comparison of single results of the studies. Physiotherapists may influence the therapy of such affected female patients significantly because the assessment of muscle strength provides them with information on muscle impairment severity and refers to a basis of the therapeutic programs for activation or relaxation of pelvic floor muscles in the physiotherapist's practice.

This study contributed to the view on the issue of pelvic floor muscle function assessment in female physiotherapists themselves who propose therapy for female patients with pelvic floor muscle dysfunction.

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